# Experiment 5

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Subject: PBLJ  Subject Code: 22CSH-359

Aim:

Develop Java programs using autoboxing, serialization, file handling, and efficient data processing and management.

Problem Statement :

1) Write a Java program to calculate the sum of a list of integers using autoboxing and unboxing. Include methods to parse strings into their respective wrapper classes (e.g., Integer.parseInt()).

2) Create a Java program to serialize and deserialize a Student object. The program should: Serialize a Student object (containing id, name, and GPA) and save it to a file. Deserialize the object from the file and display the student details. Handle FileNotFoundException, IOException, and ClassNotFoundException using exception handling.

3) Createa menu-basedJava application with the following options. 1.Add an Employee 2. Display All 3. Exit If option 1 is selected, the application should gather details of the employee like employee name, employee id, designation and salary and store it in a file. If option 2 is selected, the application should display all the employee details. If option 3 is selected the application should exit.

Algorithm:

1. Sum of a List of Integers Using Autoboxing & Unboxing:

- ☐ Initialize an empty list to store integers.
- ☐ Prompt the user to enter integers.
- ☐ Read input as a string, and if it's a valid number, parse it using Integer.parseInt().
  - ☐ Autoboxing occurs when adding int values to the List<Integer>.
- ☐ Repeat until the user enters "stop".
- ☐ Call a method calculateSum():
  - ☐ Iterate through the list and perform unboxing (Integer→int) whil e calculating the sum.

2. Student Serialization & Deserialization:

- ☐ Create a Student class with fields (id, name, GPA) and implement Serializable.
- ☐ In the main method:
  - ☐ Prompt the user to enter student details.
  - ☐ Create a Student object with user input.
- ☐ Serialize (Save) the Student object:
  - ☐ Open a file using FileOutputStream.
  - ☐ Write the Student object using ObjectOutputStream.
  - ☐ Handle IOException.
- ☐ Deserialize (Load) the Student object:
  - ☐ Open the same file using FileInputStream.
  - ☐ Read the object using ObjectInputStream.
  - ☐ Cast it back to a Student object.
  - ☐ Handle FileNotFoundException, IOException, and ClassNotFoundException.
- ☐ Print the student details after deserialization.
- ☐ End program.

3. Employee Management System (Menu-Based) :

- ☐ Create Employee class (fields: id, name, designation, salary), implement Serializable.
- ☐ Load employees from file (if available).
- ☐ Menu:
  - ☐ Add Employee→ Get details, create object, append to list, serialize & save.
  - ☐ Display All Employees→ Deserialize & print details.
  - ☐ Exit → Terminate.
- ☐ Handle exceptions (FileNotFoundException, IOException, ClassNotFoundException).

Program :
1. Sum of a List of Integers Using Autoboxing & Unboxing:

```
import java.util.*;
public class AutoboxingUnboxingExample {
    public static int calculateSum(List<Integer> numbers) {
        int sum = 0;
        for (Integer num : numbers) {
            sum += num;
        }
        return sum;
    }
    public static void main(String[] args) {
        List<Integer> numbers = new ArrayList<>();
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter integers (type 'stop' to finish):");
        while (scanner.hasNext()) {
            String input = scanner.next();
            if (input.equalsIgnoreCase("stop")) break;
            int value = Integer.parseInt(input);
            numbers.add(value);
        }
        System.out.println("Sum: " + calculateSum(numbers));
        scanner.close();
    } }
```

2. Student Serialization & Deserialization:

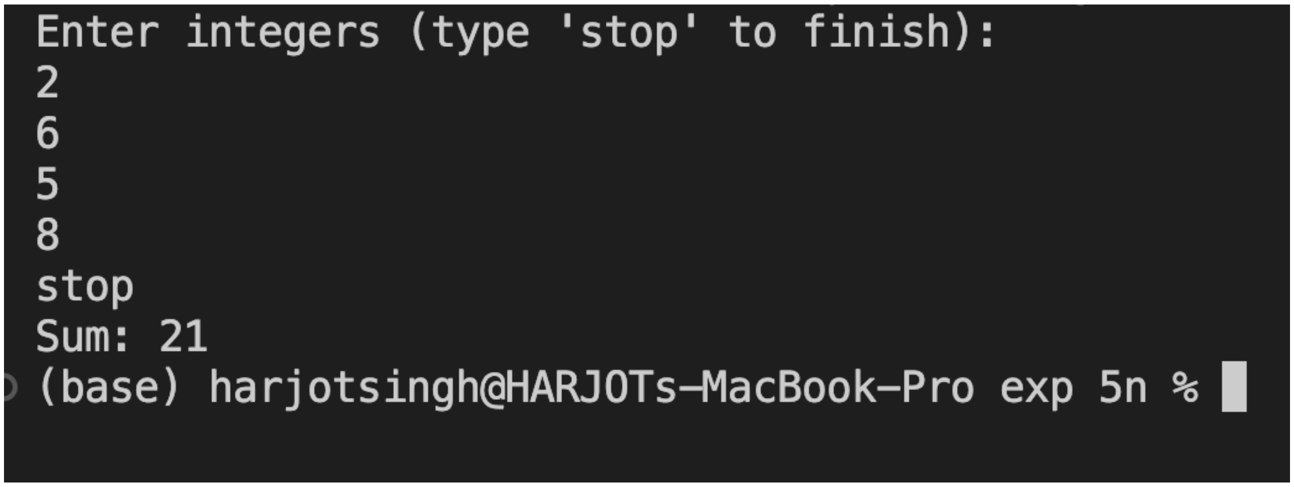
```
 import java.io.*;
 import java.util.ArrayList;
 import java.util.List;
 import java.util.Scanner;
 class Student implements Serializable {
     private static final long serialVersionUID = 1L;
     int id;
     String name;
     double gpa;
    public Student(int id, String name, double gpa) {
         this.id = id;
         this.name = name;
         this.gpa = gpa; }
     @Override
     public String toString() {
         return "Student ID: " + id + ", Name: " + name + ", GPA: " + gpa;
     } }
 public class StudentManagement {
     private static final String FILE_NAME = "students.ser";
     private static final Scanner scanner = new Scanner(System.in);
     private static List<Student> students = new ArrayList<>();
     public static void serializeStudents() {
         try (ObjectOutputStream oos = new ObjectOutputStream(new
    FileOutputStream(FILE_NAME))) {
              oos.writeObject(students);
              System.out.println("All students serialized successfully!");
         } catch (IOException e) {
              System.out.println("Error during serialization: " + e.getMessage());
         }  }
     public static void deserializeStudents() {
         try (ObjectInputStream ois = new ObjectInputStream(new
       FileInputStream(FILE_NAME))) {
              students = (List<Student>) ois.readObject();
              System.out.println("\nDeserialized Student List:");
              for (Student student : students) {
                  System.out.println(student);
              }
         } catch (FileNotFoundException e) {
              System.out.println("File not found! Please add students first.");
         } catch (IOException | ClassNotFoundException e) {
              System.out.println("Error during deserialization: " + e.getMessage());
         }  }
     public static void main(String[] args) {
         while (true) {
              System.out.println("\n1. Add Student\n2. Display Students\n3. Exit");
              System.out.print("Choose an option: ");
              int choice = scanner.nextInt();
              switch (choice) {
                  case 1 -> {
                      System.out.print("Enter Student ID: ");
                      int id = scanner.nextInt();
                      scanner.nextLine();
                      System.out.print("Enter Student Name: ");
                      String name = scanner.nextLine();
                      System.out.print("Enter Student GPA: ");
                      double gpa = scanner.nextDouble();
                      students.add(new Student(id, name, gpa));
                      serializeStudents();
                  }
                  case 2 -> deserializeStudents();
                  case 3 -> {
                      System.out.println("Exiting...");
                      scanner.close();
                      System.exit(0);
                  }
                  default -> System.out.println("Invalid choice! Try again.");
         } } } }
```

3. Employee Management System (Menu-Based) :

```
import java.io.*;
import java.util.*;
class Employee {
    String empId, name, designation;
    double salary;
    public Employee(String empId, String name, String designation, double salary) {
        this.empId = empId; this.name = name; this.designation = designation; this.salary
= salary;
    }
    @Override
    public String toString() {
        return empId + ", " + name + ", " + designation + ", " + salary;
    } }
public class EmployeeManagementApp {
    private static final String FILE_NAME = "employees.txt";
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        while (true) {
            System.out.println("\n1. Add Employee  2. Display All  3. Exit");
            System.out.print("Choice: ");
            switch (scanner.nextInt()) {
                case 1: addEmployee(scanner); break;
                case 2: displayEmployees(); break;
                case 3: System.out.println("Goodbye!"); scanner.close(); System.exit(0);
                default: System.out.println("Invalid choice!");
```

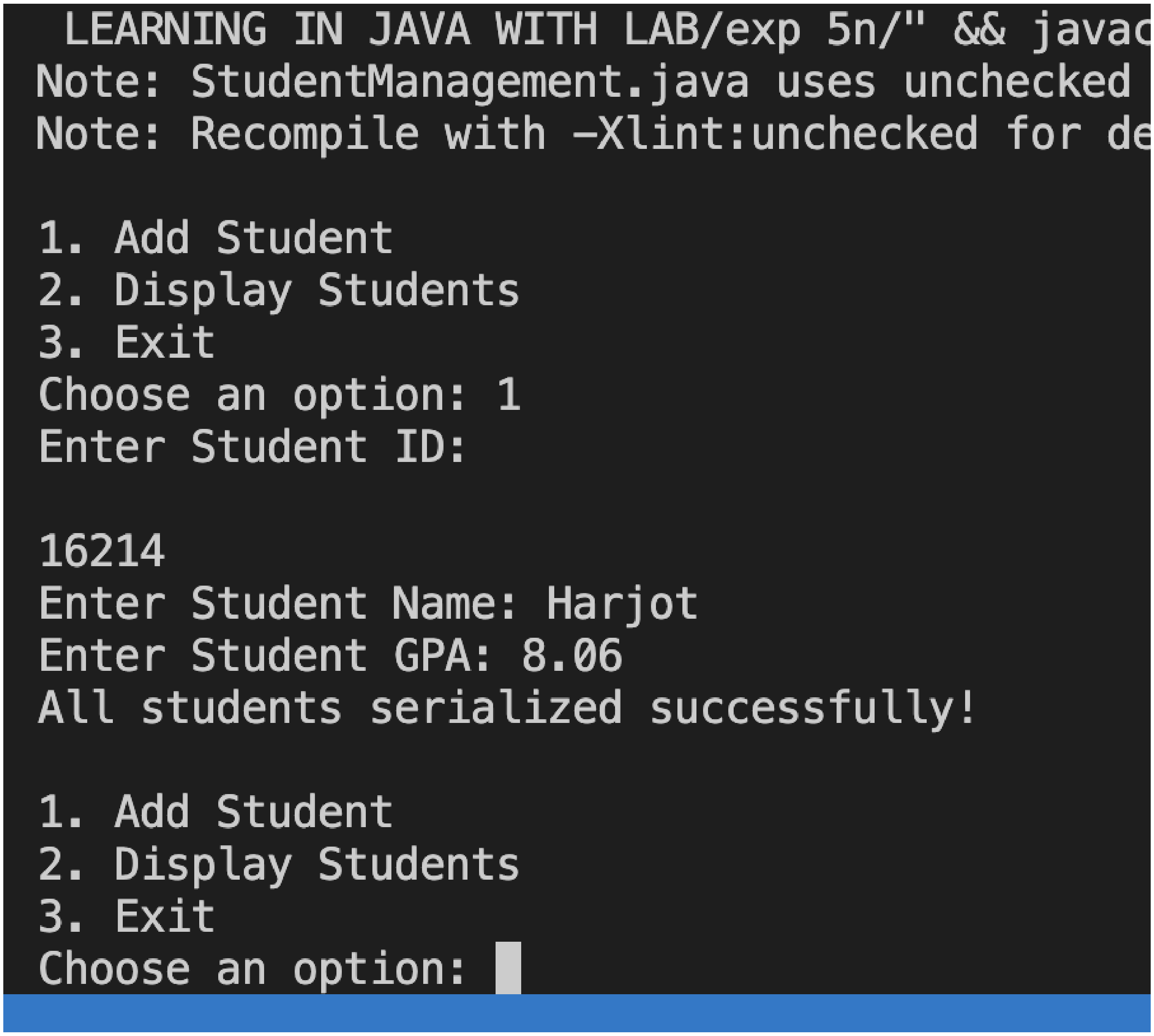
```
     }} }
  private static void addEmployee(Scanner scanner) {
      try (PrintWriter out = new PrintWriter(new FileWriter(FILE_NAME, true))) {
          scanner.nextLine();
          System.out.print("ID: "); String empId = scanner.nextLine();
          System.out.print("Name: "); String name = scanner.nextLine();
          System.out.print("Designation: "); String designation = scanner.nextLine();
          System.out.print("Salary: "); double salary = scanner.nextDouble();
          out.println(new Employee(empId, name, designation, salary));
          System.out.println("Employee added!");
      }
         catch (IOException e) { System.out.println("Error saving employee.");
    } }
  private static void displayEmployees() {
      try (BufferedReader br = new BufferedReader(new FileReader(FILE_NAME))) {
          System.out.println("\nEmployees:"); br.lines().forEach(System.out::println);
      }
          catch (IOException e) { System.out.println("No employees found.");
   } }}
```

OUTPUT :



```
Enter integers (type 'stop' to finish):
2
6
5
8
stop
Sum: 21
(base) harjotsingh@HARJOTs-MacBook-Pro exp 5n %
```

2. Student Serialization & Deserialization:



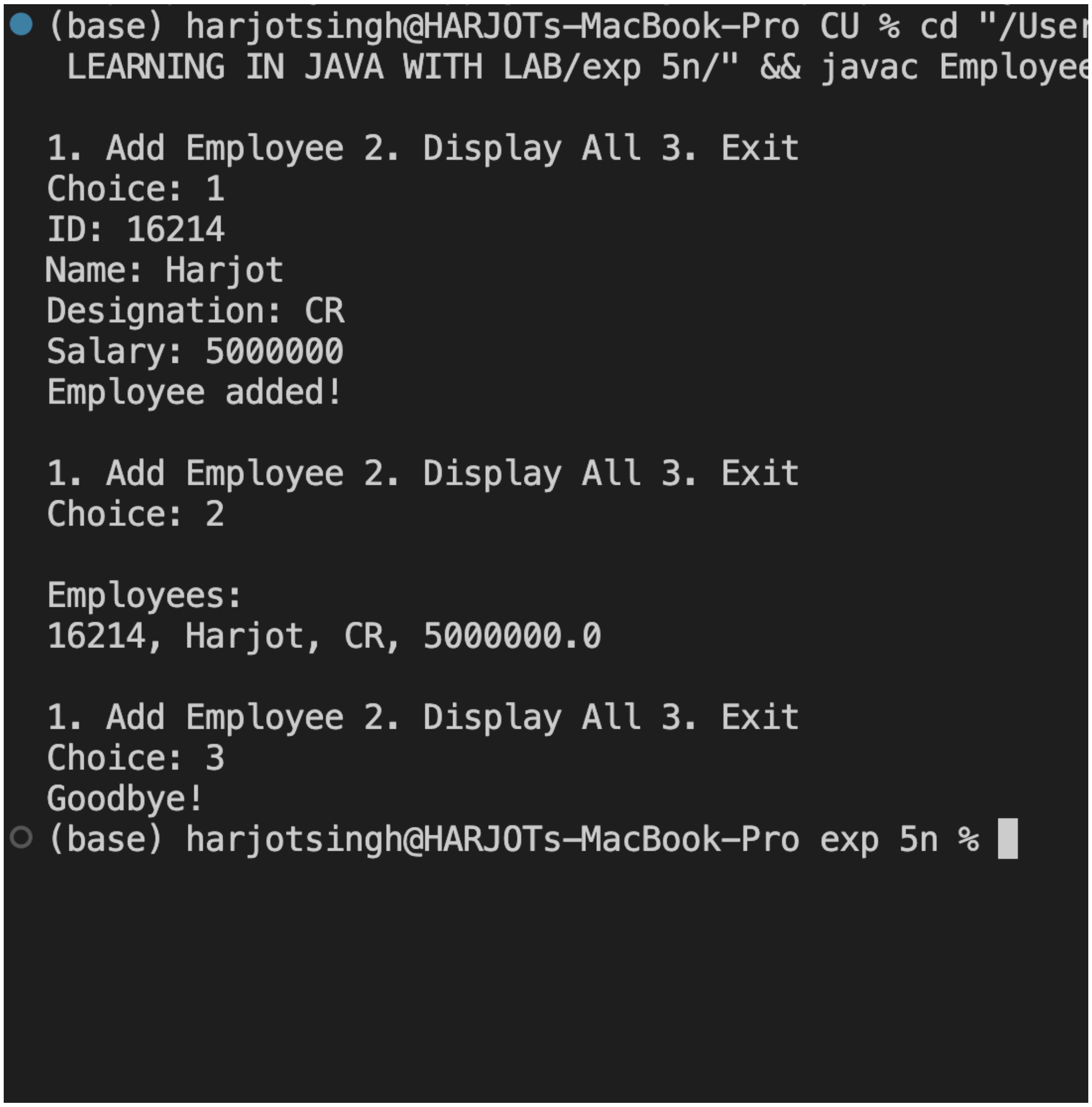
```
 LEARNING IN JAVA WITH LAB/exp 5n/" && javac
Note: StudentManagement.java uses unchecked
Note: Recompile with -Xlint:unchecked for de

1. Add Student
2. Display Students
3. Exit
Choose an option: 1
Enter Student ID:

16214
Enter Student Name: Harjot
Enter Student GPA: 8.06
All students serialized successfully!

1. Add Student
2. Display Students
3. Exit
Choose an option: 
```

3. Employee Management System (Menu-Based) :



```
● (base) harjotsingh@HARJOTs-MacBook-Pro CU % cd "/User
  LEARNING IN JAVA WITH LAB/exp 5n/" && javac Employee

 1. Add Employee 2. Display All 3. Exit
 Choice: 1
 ID: 16214
 Name: Harjot
 Designation: CR
 Salary: 5000000
 Employee added!

 1. Add Employee 2. Display All 3. Exit
 Choice: 2

 Employees:
 16214, Harjot, CR, 5000000.0

 1. Add Employee 2. Display All 3. Exit
 Choice: 3
 Goodbye!
○ (base) harjotsingh@HARJOTs-MacBook-Pro exp 5n %
```

Learning Outcomes:

- Implement object-oriented programming with classes, encapsulation, and serialization.
- Utilize core Java concepts like loops, conditionals, autoboxing, and unboxing.
- Apply file handling with serialization, deserialization, and exception management.